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HUMAN RESOURCE INNOVATION  
MARINE INDUSTRY STANDARDS  
WELDING  
INDUSTRIAL ENGINEERING  
EDUCATION AND TRAINING

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# **THE NATIONAL SHIPBUILDING RESEARCH PROGRAM**

## **Proceedings of the REAPS Technical Symposium**

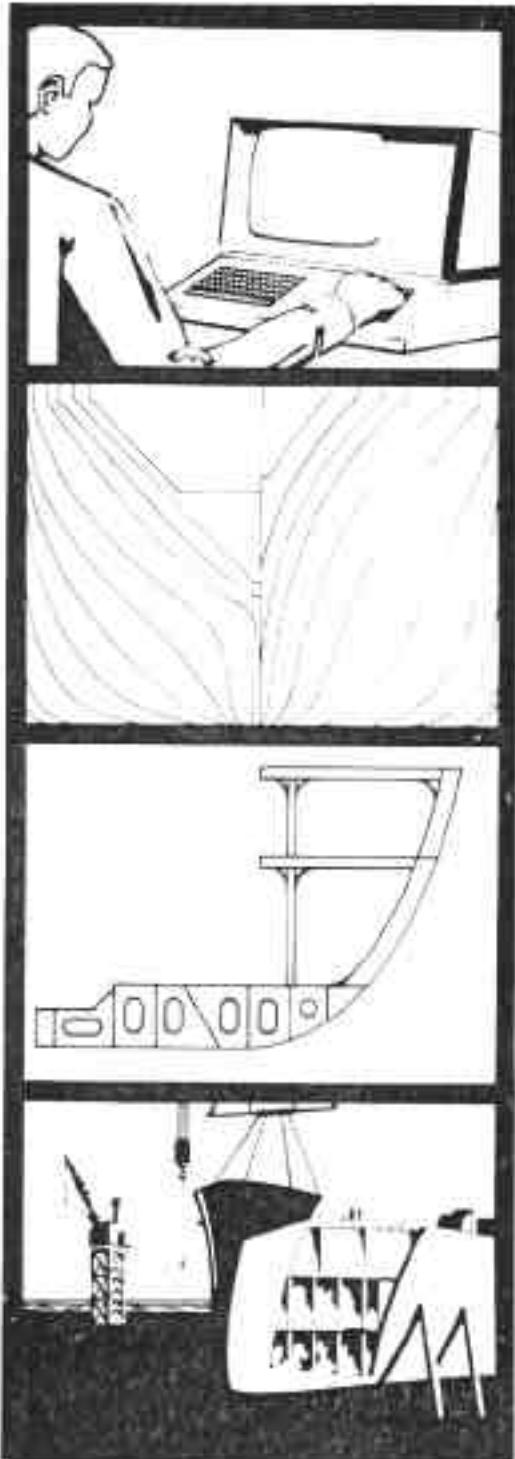
### **Paper No. 12: Network Scheduling of Shipyard Production, Engineering, and Material Procurement**

U.S. DEPARTMENT OF THE NAVY  
CARDEROCK DIVISION,  
NAVAL SURFACE WARFARE CENTER

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R ESEARCH  
AND  
ENGINEERING  
FOR  
AUTOMATION  
AND  
PRODUCTIVITY  
IN  
SHIPBUILDING

Proceedings of the  
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**NETWORK SCHEDULING OF SHIPYARD PRODUCTION,  
ENGINEERING AND MATERIAL PROCUREMENT**

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As Director of Shipyard Planning Services, Mr. Boucher is currently responsible for production planning and control services in shipyards, as well as system development and research. For the past 7 years, he has been involved in assisting various shipyards in the United States and Canada to improve their planning techniques and cost/schedule control systems. SPAR is currently engaged in providing production scheduling services to a number of yards in support of their planning staffs.

Prior to his involvement with SPAR, Mr. Boucher studied business administration and worked in management consulting.

### PERT-PAC FEATURES

- \* Random network node numbering
- \* Multiple starting/ending, networks
- \* Sub-network, processing
- \* Multiple network processing
- \* Automatic network, loop detection
- \* Positive or negative activity lead time
- \* Automatic holiday and/or weekend schedule adjustment
- \* Automatic work week or shift adjustments
- \* Various activity sort list options
- \* Activity schedule bar charts
- \* Detailed node event schedule reports
- \* Summary milestone event schedule reports
- \* Critical activities analysis reports
- \* Activity cataloguing to work breakdown structure, production work centers, ship zone, and/or steel unit.

## PERT-PAC

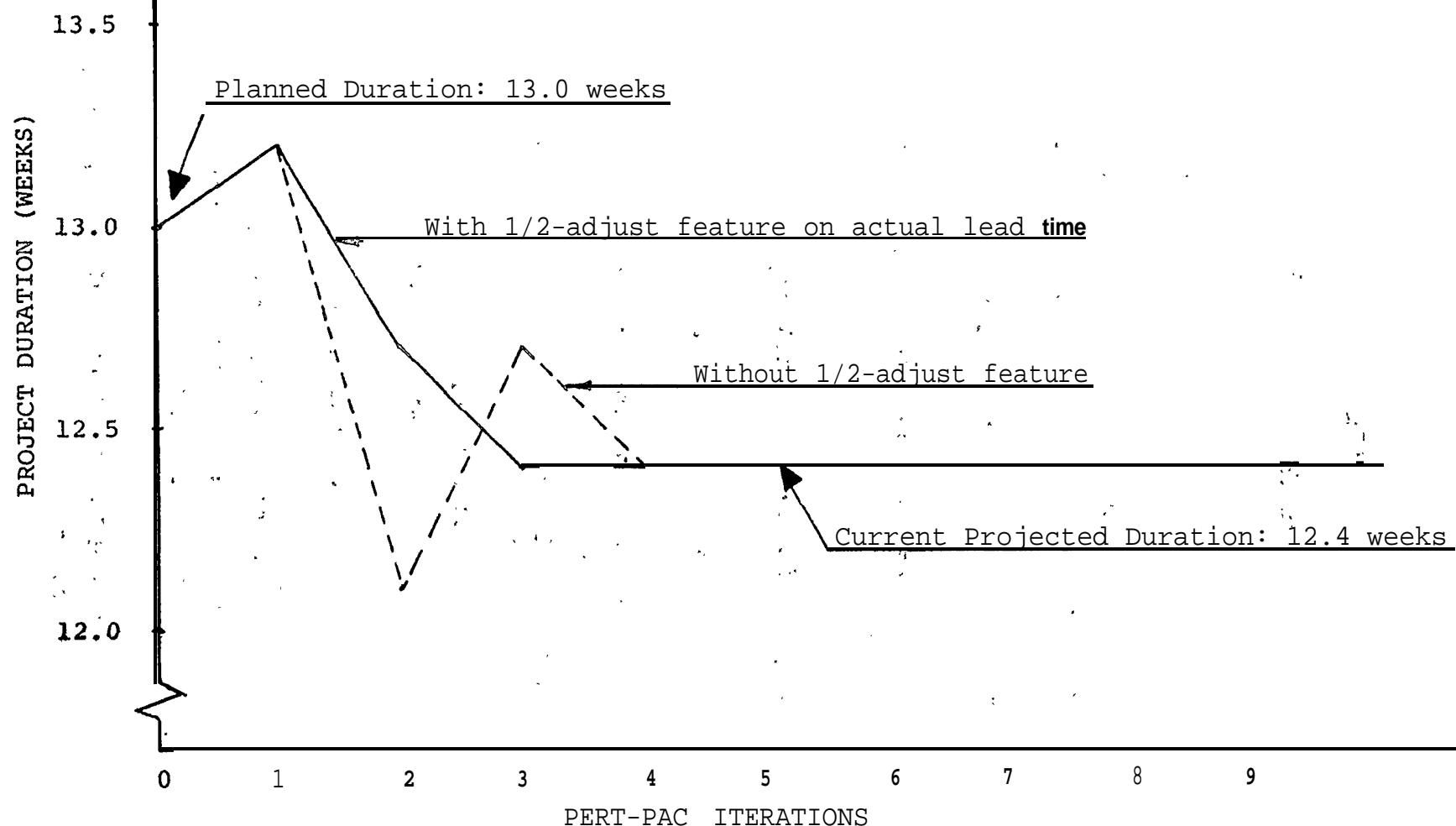
### SPECIAL BENEFITS

- \* Direct access to WORK-PAC and performance information
- \* Simultaneous processing of preliminary planning work packages with actual, detailed production work packages
- \* Automatic re-scheduling of WORK-PAC options
- \* Automatic network updating; manual progress assessments not required
- \* Automated in-progress work adjustments
- \* Automated completed work adjustments
- \* Automated lead time adjustments
- \* Management visibility through schedule summary reports

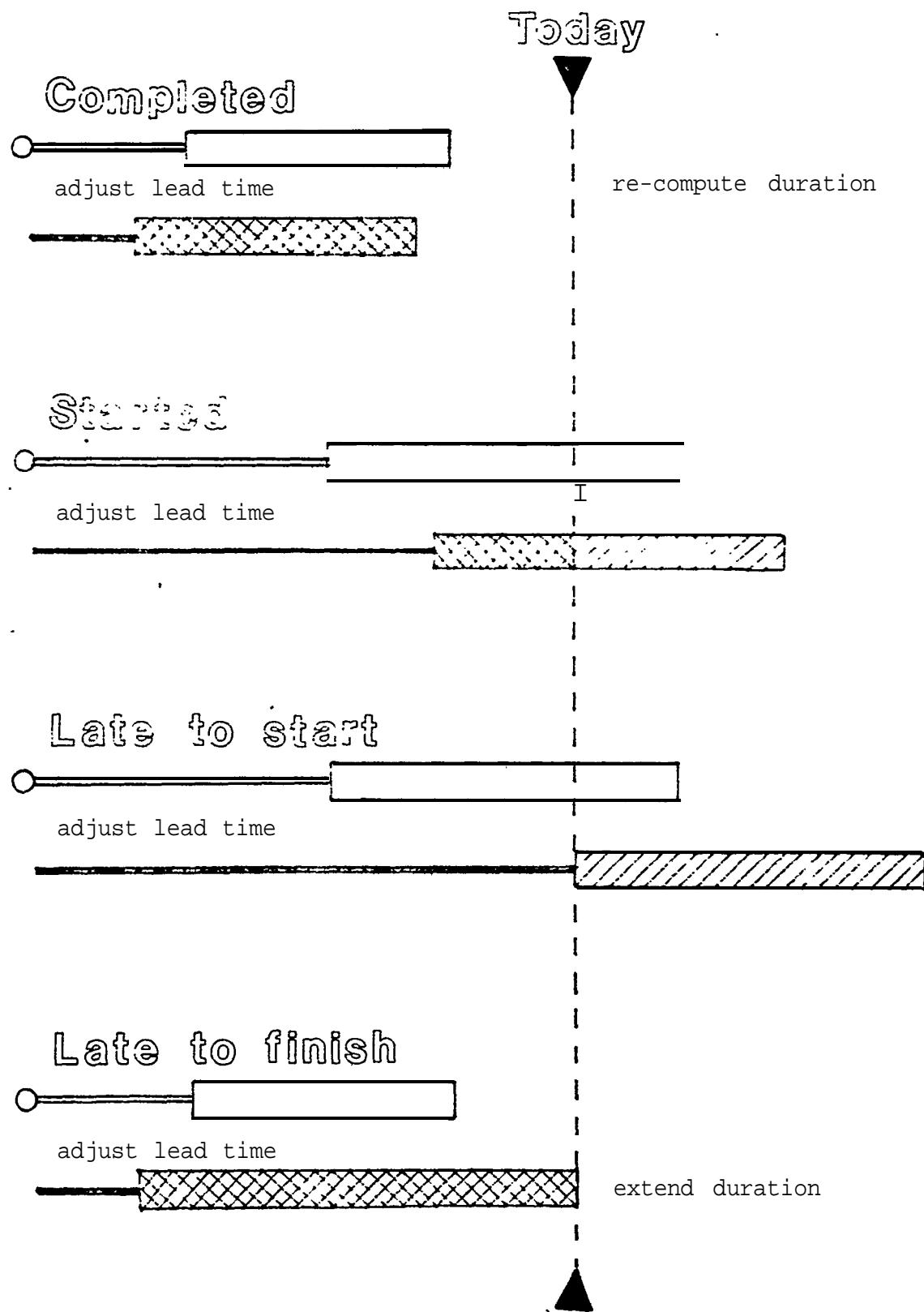
Milestone Report  
Critical Activity Report

- \* Schedule variance reporting
  - ' Automatic comparison of planned versus actual and current projected schedules
  - . Total Project Slippage Report
- \* Automatic impact visibility of change orders and design changes

FIGURE 5  
PERT-PAC SLIPPAGE ADJUSTMENTS  
SAMPLE 27 ACTIVITY NETWORK



# AUTOMATED ADJUSTMENTS



## PERT-PAC CRITICAL ACTIVITY ANALYSIS

2/ 1/0 PAGE 1

HULL W/C	PRG		PLANNED		CURRENT		WKS DELAY STA KT	WKS DELAY STA KT
			START	FINISH	START	FINISH		
1980. 0.	800.	REMOVE REFRACTIMATRL	1/ 5/0	1/15/0 C	1/ 3/0	1/14/0	-0.3	-0.1
1980. 0.	500.	REMOVE AIR REGISTERS	1/ 1/0	1/ 4/0 C	1/ 5/0	1/ 7/0	<b>0.6</b>	0.4
1980. 30.	400.	INITIAL HYDRO TEST	1/ 1/0	1/ 5/0 C	1/ 2/0	1/ 7/0	C.1	0.3
1980. 0.	1300.	REPAIR INNER PASING	1/15/0	3/ 7/0 S	1/11/0	3/ 3/0	-0.6	-0.6
1980. 0.	2300.	CHEM CLEAN TURBINE	3/ 7/0	3/11/0	3/ 3/0	3/ 7/0	-0.6	-0.6
1980. 0.	2400.	PRELIM HYDRO TEST	3/11/0	3/19/0	3/ 7/0	3/15/0	-0.6	-0.6
1980. 0.	2600.	INSTALL DRUM INTRNL	3/19/0	3/28/0	3/15/0	3/24/0	-0.6	-0.6
1980. 0.	2700.	FINAL HYDRO TEST	3/28/0	4/ 1/0	3/24/0	3/27/0	<b>-0.6</b>	-0.7
1980. 0.	2800.	INSTL PLASTIC REFRAC	4/ 1/0	4/ 1/0	3/27/0	3/28/0	-0.7	-0.6
1980. 0.	1100.	EXPLORATORY BLOCK	1/15/0	1/30/0 S	1/15/0	2/ 1/0	0.0	0.3
1980. 0.	1700.	R-R SPR HT TULES	1/30/0	3/ 1/0	2/ 2/0	3/ 2/0	0.4	0.1
1980. 0.	2100.	REPAIR OUTER CASING	3/ 7/0	4/ 1/0	3/ 3/0	3/27/0	-0.6	-0.7
1980. 0.	500.	REPAIR BILGE CASING	1/16/0	2/22/0 S	1/17/0	2/22/0	0.1	0.0
1980. 0.	200.	REPAIR BILGE CASING	1/ 1/0	1/16/0 C	1/ 3/0	1/17/0	0.3	0.1
1980. 0.	1200.	FINISH REPAIR CASING	2/22/0	3/25/0	2/22/0	3/26/0	0.0	0.1
1980. 0.	900.	REMOVE DRUM INTRNL	1/ 5/0	1/ 8/0 C	1/ 3/0	1/ 9/0	-0.3	0.1
1980. 0.	2200.	RE-BRICK	3/ 7/0	3/17/0	3/ 3/0	3/13/0	-0.6	-0.6
1980. 0.	2500.	INSTALL AIR REGISTR	3/17/0	3/25/0	3/13/0	3/21/0	-0.6	-0.6
1980. 0.	18.	R-R SUPPORT TUBES	1/30/0	3/ 1/0 S	1/27/0	2/25/0	-0.4	-0.6
1980. 0.	1000.	REPAIR SLICING SEAT	1/23/0	2/22/0 S	1/20/0	2/18/0	0.4	-0.6
1980. 0.	600.	INSPECT SLIDING SEAT	1/16/0	1/23/0 S	1/17/0	2/ 1/0	0.1	1.3 *

CURRENT SCHEDULE SLIPPAGES HAVE CAUSED NETWORK TO SLIP -0.57 WORK WEEKS = -2.85 WORK DAYS

TOTAL DURATION 1/ 1/0 THRU 3/28/0      12.43 WORK WEEKS = 62.14 WORK DAYS)

FIGURE 8: PERT-PAC Critical Activity Analysis

## MANPOWER PLANNING & CONTROL

From scheduled work packages, WORK-PAC develops

- \* Planned manpower
- \* Actual manpower expended to-date
- \* Projected manpower using production performance data

Special options include:

- \* Monthly averaging
- \* Trade breakdown detail
- \* Manpower Levelling
- \* Automatic generation of manhour "S" curve:
  - : planned
  - : actual
  - : projected

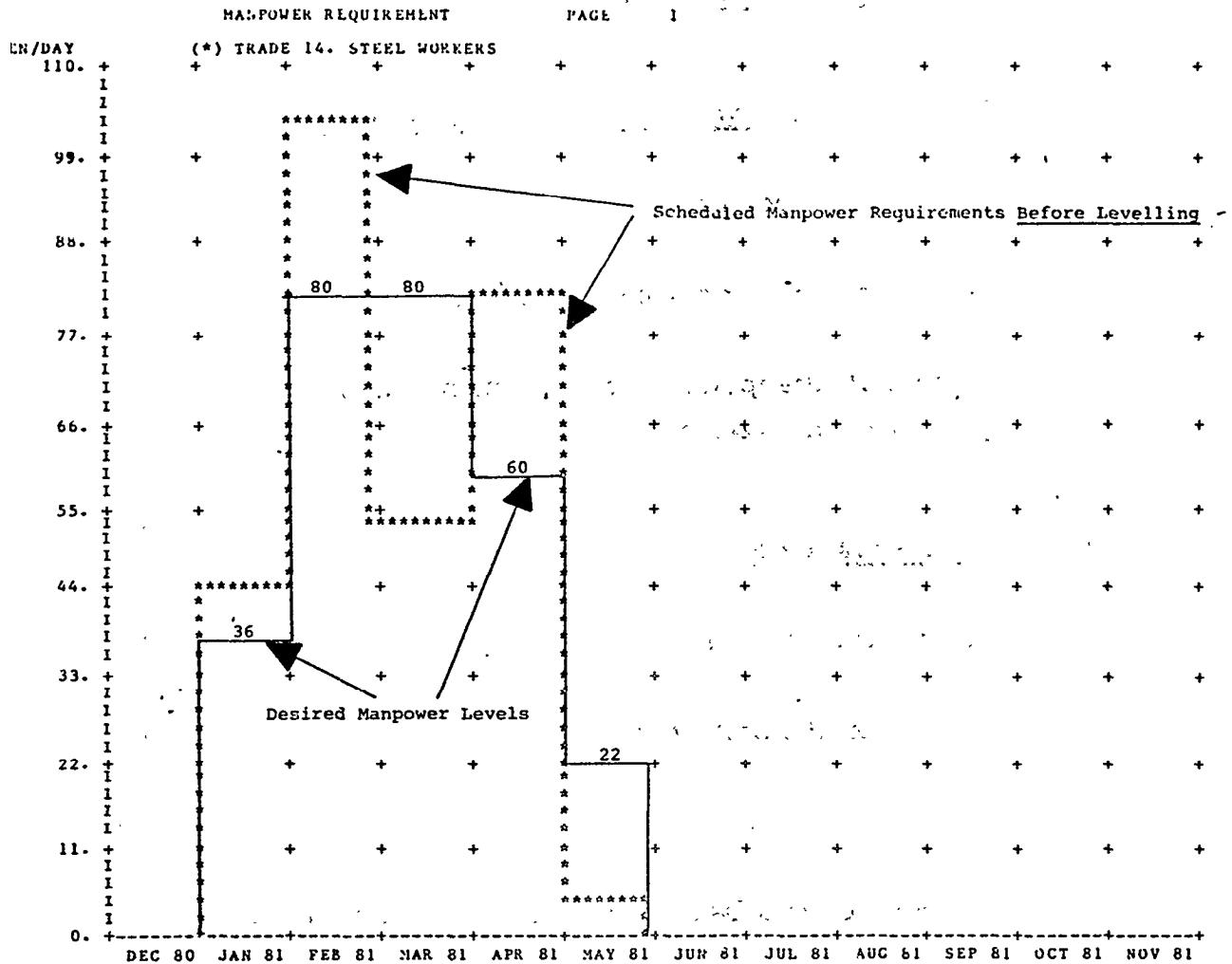


FIGURE 5c: Computer Generated (PERT-PAC) Manloading With Desired Manload Levels Superimposed

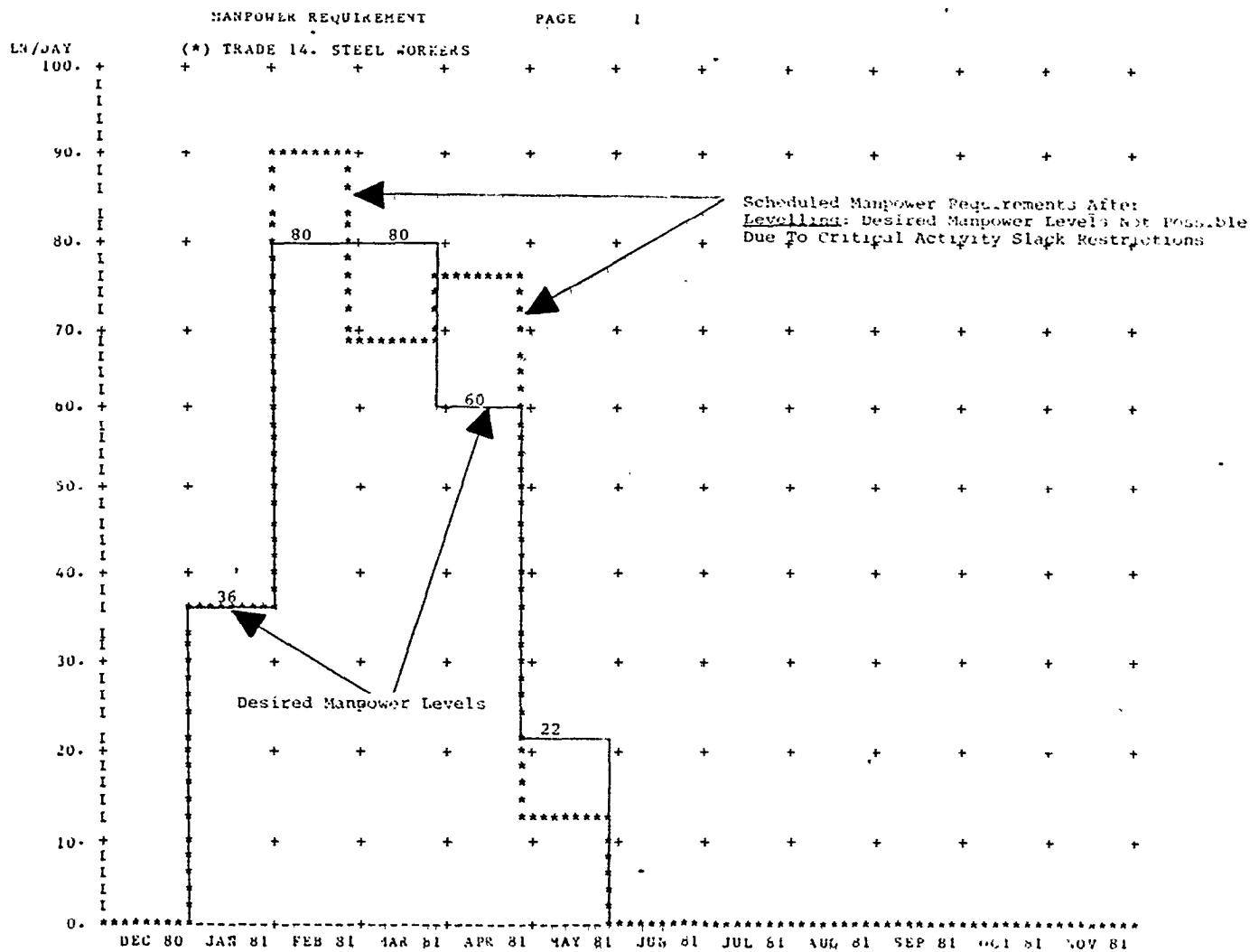


FIGURE 5d: Computer Generated (PERT-PAC) Levelling Of Manload Within Constraints Of Critical Delivery Schedules

## MICRONETS

### Pre-developed sub-networks:

- \* Can be used for any number of projects
- \* Can be used as often as needed within a given project
- \* Can be linked to other micronets

### major Benefits:

- \* Increased Confidence in Network By Production and Management
- Reduced Network Development, Efforts
- \* Reduced Data Errors
- \* Reduced Opportunities To Neglect Important Activities

### Disciplined & Orderly Network Logic:

- \* 'Improved Visibility Even With More Detail'
- \* 'Easier Networks To Modify'

### Special Feature

- \* Automated Activity Numbering
- \* Automated Node Numbering
- \* Automated Activity Budget Computations
- \* Automated Activity Duration Computations

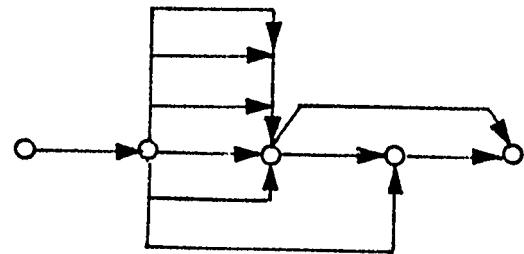
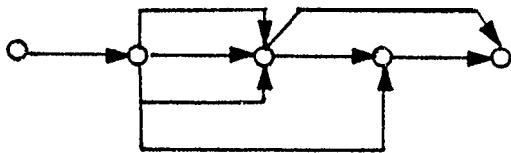
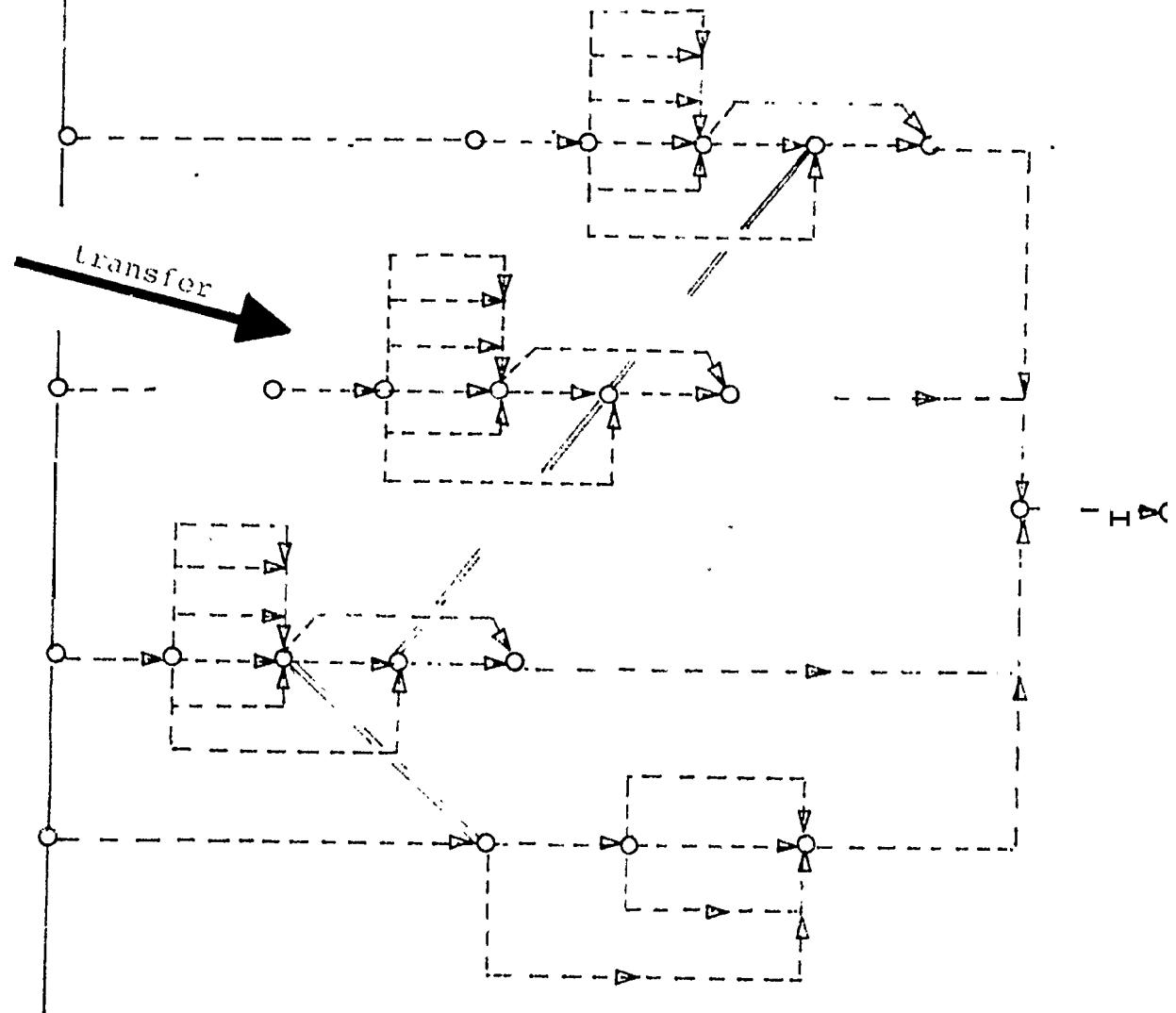
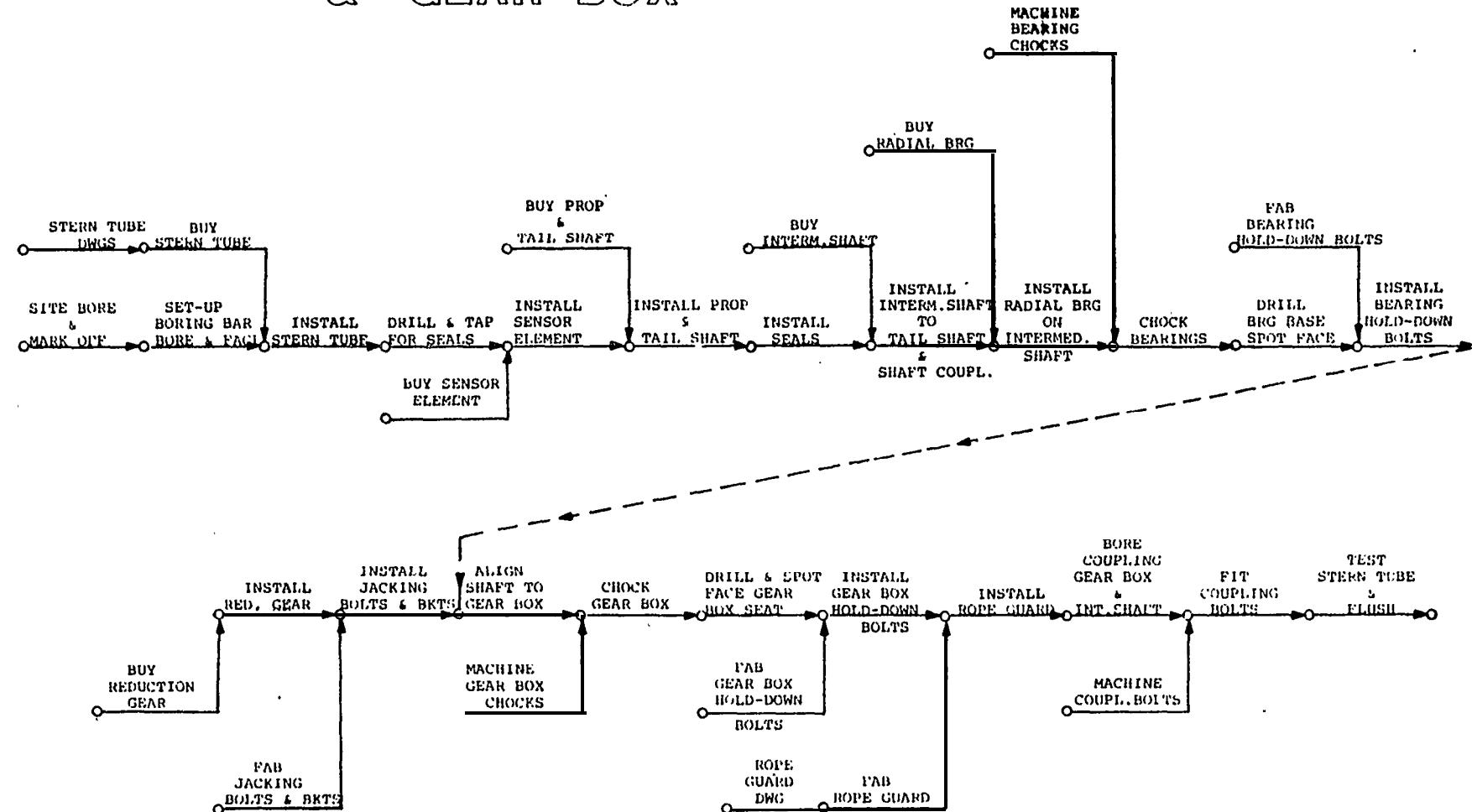
**MICRO-NET**Cloned & Modified  
Micro-net**PROJECT NETWORK**

Figure 1: Transfer of micro-net from library to project network

# PROPELLER, STERN TUBE, SHAFTING & GEAR BOX



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